REMARKS
ON THE
INSTITUTES
OF
Experimental Chemistry, &c.

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ON Z., A. K

Mr. ROBERT DOSSIE'S

INSTITUTES

OF

Experimental Chemistry,

IN A

LETTER

Addreſſed to the Authors of the *Review*, &c.

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LONDON:

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M.DCC.LX.

REMARKS

ON

Mr. ROBERT BOYLE'S

INSTITUTES

OF

Experimental Chemistry,

MVSEVM
BRITAN
NICVM

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Printed for S. Hooper, the Corner of the New-
Church, in the Strand.

A LETTER, &c.

GENTLEMEN,

I HAVE obſerved, with regret, that you have not exerciſed the ſame critical diſcernment on books of chemiſtry and the chemical arts, as on thoſe of leſs intereſting ſubjects. The cenſures, paſſed in your Reviews, upon chemical performances, are ſometimes juſt: the commendations are generally otherwiſe.

The Elaboratory, the Handmaid, and the Inſtitutes of Experimental Chemiſtry, are examples of your being impoſed on by the ſpecious pretences of authers, and applauding without examination. The few following Remarks on the *Inſtitutes*, wherein I have confined myſelf to thoſe points which the author informs us in the preface he has particularly aimed at, will probably ſet this new luminary in a different point of view from that in which you have exhibited him.

The author has labour'd at [a] "A ſyſtem of chemical philoſophy, founded, like the mechanical, on general principles." What he calls general principles are deduced only from particular facts, and by being made general, they are made falſe. Thus, as the metallic ſalt vitriol parts with its acid in the fire, it is affirmed that all metallic ſalts will do the ſame; [b] whereas, of thoſe made with the marine acid, there is not a ſingle one that will. In the table of ſpecific attractions (one of the fundamental doctrines of his ſyſtem) we are taught, [c] that all acids have a greater attraction to mercury than to ſilver, which, though true in regard to the marine acid, is falſe in regard to the nitrous; that they have a greater attraction to mercury than to tin or antimony, which is true in regard to the nitrous, and falſe in regard to the marine; greater to zinc than to iron, which is true in regard to the nitrous and marine, and falſe in regard to the vitriolic; greater to mercury than to lead, which ſeems to be true in regard to the vitriolic, but is falſe in regard to the

[a] Preface, Page xi.
[b] Vol. i. Page 367.
[c] Vol. i. Page 274.

nitrous

nitrous and marine; greater to fixt alkalies than to lime or metals, and greater to phlogiston than to any other of the bodies enumerated, both which are true or falſe according to the circumſtances of application. Even the deflagration of nitre with inflammable ſubſtances, than which nothing ſeems to bid fairer for a general principle, is, in our author's ſenſe, by no means ſuch: For if the nitre be melted, and a certain proportion of ſome inflammable matters, as antimony freed from a part of its ſulphur, be immerſed in it, no deflagration will enſue. Our author, diſregarding ſuch particular circumſtances, and depending on the univerſality of the principle, aſſerts falſly, that nitre cannot be melted in veſſels made of the deflagrable metals, and that the empyrical fever powder is the ſame with diaphoretic antimony; [a] the contrary of which is obvious from common experience, the fever powder proving generally purgative or emetic, which diaphoretic antimony is never obſerved to do. Nothing can be more dangerous in chemiſtry than this ſpirit of generalizing.

[a] Vol. i. Page 241.

The author preſumes that he *has gone much farther in the inveſtigation of the general principles, on which nature conducts her operations in the minuter parts of the ſyſtem, than any writings already publiſhed lead.* He ſeems here to have an eye to the theories, or rather reveries, about animals and vegetables; as that of putrid ferments in the blood; of vital ferments tranſfuſed from birds to the egg, and there lying inveloped in particular veſſels; and the project of explaining the phænomena of the animal and vegetable œconomy, from the water, ſalt, phlogiſton and earth, into which the parts of animals and vegetables are reſolved by putrefaction and by fire. The author himſelf admits, that by this ultimate reſolution or deſtruction, nearly all the different parts of all animals and vegetables are reduced into the ſame principles: How then can we deduce, from thoſe principles, even their obvious groſs differences from one another? much leſs their different actions in the body of the living ſubject. The ſame heat which liquifies the glutinous matter of the animal ſolids, coagulates that of the fluids; and what water, ſalt,

ſalt, earth, oil or phlogiſton, can be diſcovered in one more than in the other? The author indeed acknowledges, that nature, in many inſtances, deviates from the laws he has eſtabliſhed; or in other words, that he has himſelf deviated from the laws eſtabliſhed by nature. How can he pretend to have diſcovered the principles on which nature conducts her operations, when many of thoſe operations are directly repugnant to the principles he has advanced!

He preſumes alſo, that he has *made ſeveral material diſcoveries, relating to particular ſubjects.* What theſe diſcoveries are, I cannot find, unleſs they be ſome ſuch as the following: [a]That ſtones are compoſed of earth and oil, in proof of which it is affirmed, that flints, diſtilled in a retort, give over an actual oil: This however is falſe, unleſs we ſuppoſe, with the author, that the bitumen, which yields the *Britiſh* oil, is flint: That neutral ſalts may be prepared by combining gypſum with acids [b]; whereas it is an

[a] Page 246, Vol. i. [b] Page 361, Vol. i.

eſſential

eſſential character of gypſum not to be combinable with any acid: [a]That the *ſel de ſeignette* is the ſame with ſoluble tartar, [b]and the *ſpiritus ſalis marini coagulatus* the ſame with common ſalt; the contrary of which is not only obvious from experiment, but may even be deduced from the author's own theory; for as natron or ſoda, and the common vegetable alkalies, are admitted to be very different, does it not follow that ſalts compounded of the one, cannot be the ſame with thoſe compounded of the other? [c]That nitre, deflagrated with ſulphur, produces an alkaline ſalt; whereas it obviouſly produces no other than the *nitrum vitriolatum*: [d]That vitriolated tartar may be uſed to great advantage in making glaſs, on account of its fluxing quality; a quality which it abſolutely wants: That *Saxon* blues may be dyed on the principle of oil of vitriol ſtriking a blue colour with arſenic [e]; whereas theſe materials produce no manner of blueneſs, the ſubſtance which gives the colour, being no other than the common blue drug indigo: [f]That ſcarlet

[a] Page 300, Vol. i. [b] Page 310, Vol. i. [c] Page 340, Vol. i.
[d] Page 309, Vol. i. [e] Page 330, Vol. i. [f] Page 410, Vol. i.

may

may be dyed with cochineal, by means of putrid urine; an addition which would deſtroy the ſcarlet tint: [a] That urine contains an acetous ammoniacal ſalt; whereas it contains, in the ſtate he mentions it, neither one nor the other of the ingredients of that ſalt: That the matter in urine, which forms the calculus, is chemically of the ſame nature with tartar of vegetables; tho' it is acknowledged not to have any one of the ſpecific characters of tartar, to be neither ſubacid, nor convertible into an alkali: That the pigment, called *Pruſſian* blue, is, in its whole ſubſtance, no other than a blue fixt animal ſulphur; [b] whereas it is demonſtrable that *Pruſſian* blue is iron, and that no ſulphur of any kind is contained in animals: That the property of galls, and ſome other vegetables, of turning ſolution of vitriol black, depends not on their aſtringency, but on a peculiar ſpirit; [c] a notion repugnant to the author's own principles, for the tinging matter cannot be made to *riſe in diſtillation*,

[a] Page 456, Vol. i. [b] Page 397, Vol. i. [c] Page 39, Vol. ii.

which

which is the eſſential character of ſpirits: That volatile alkaline ſalts ariſe from acrid plants, with the heat of boiling water; whereas nothing is found to ariſe with this heat but the water and eſſential oil of the plant: That the cauſtic acrimony of eſſential oils is univerſally in proportion to the ſtrength of their ſmell[b]; whereas the ſtrongeſt ſmelling oil I know of (that of aniſeeds) has the leaſt acrimony: That ſpirit of wine diſſolves myrrh[c], and does not diſſolve amber[d]; whereas it really diſſolves one as much as the other, extracting only a part from both: That this ſpirit diſſolves no ſalts except the *ſal diureticus*[e]; whereas it is well known to diſſolve many others, as the ammoniacal nitre, and moſt of the metallic ſalts made with the marine acid: That gold is made pale by fuſion with nitre[f]; the very ſubſtance principally made uſe of for heightening its colour: That calx of biſmuth is not vitreſcible[g]; whereas there is no calx, except, perhaps, that of lead, which vitrefies ſo eaſily: That the converſion of iron into ſteel depends[h] on the expulſion of

[a] Vol. ii. Page 12, 84. [b] 128. [c] 164. [d] 161. [e] 36. [f] 248. [g] i. 232. [h] ii. 377.

mineral

mineral ſulphur; the contrary of which is evident from the re-converſion of ſteel into iron, and other experiments. What the author means by his diſcoveries muſt, I think, be the foregoing, or others of the ſame kind, of which there is a very great number; for I cannot recollect one inſtance, of his differing from what has been already publiſhed by others, either in theory or in matter of fact, without being plainly miſtaken.

He has *given full inſtructions for the fabrication of the apparatus, there not having been, before, any attempt towards accommodating the inſtruments of chemiſtry ſolely to experimental purpoſes.* The attempts for this purpoſe of *Glauber*, *Figani*, *Becher*, and Doctor *Shaw*, are well known. How far our author's apparatus comes ſhort of ſome of theirs, and how much he has borrowed from a later writer, *Cramer*, will be obvious upon compariſon.

He has *ſubjoined ample directions for the execution of the operations.* Many of theſe

 direct-

directions evince, that the author has no practical knowledge of them; for who, that is in the leaſt converſant in chemical experiments, could think, for inſtance, of taking *Windſor* loam and *Sturbridge* clay as equivalent to one another, whether for lutes, furnaces, or veſſels? or of coating retorts for a ſand heat! Not to mention methods of operation more inconvenient than thoſe in common uſe, though ſometimes propoſed as improvements, there are ſome proceſſes directed in a manner abſolutely impracticable. Thus the roaſting of metallic ores, for the diſſipation of their ſulphur, is ordered to be performed in veſſels well cloſed[a]; and in the ſmelting of ores, in mixture with the fuel[b], the ore is directed to be thrown in at the ſmall hole or ſlit, towards the bottom of the furnace, through which the nozzle of the bellows is inſerted; a part where it is impoſſible to be thrown in. This error ariſes from miſunderſtanding *Cramer*'s account. Our author has given directions for the fabrication of a ſmelting furnace, but if he had ever ſeen

[a] Page 294, Vol. ii. [b] Page 308, Vol. ii.

one,

one, I think he could not poſſibly have fallen into ſuch a miſtake.

The ſubjects are earths, ſalts, animals, vegetables, and metallic bodies. The author gives experiments and proceſſes on the particular kinds of bodies, but has prefixed a conciſe view of the philoſophical hiſtory of each article, and ſubjoined obſervations explanatory. A work conducted on this plan, how well ſoever executed, would not be a ſyſtem of chemical philoſophy; for, ſurely, it is not the buſineſs of chemical philoſophy to mould common facts into the form of *proceſſes*: The point ought rather to be, to deliver the ſimple truth, diveſted of that inſignificant parade. If the ſyſtem is compleated on this plan, it muſt extend to ſeveral ſcores of volumes.

The author informs us that *nothing can be more crude and unſettled than the common diſtribution of bodies, that characteriſtic qualities are abſolutely wanting, and that he thinks himſelf particularly happy in having been able to diſcover and mark out, by clear and evident*

criterions, the diſtinctions of genus and ſpecies in bodies, from their real interiour nature. How happy he has been in this reſpect, will appear from a few examples. His criterions of earths are, to be incapable of analyzation, inſoluble in water, infuſible without vitrification, incombuſtible, fixt, pulverine or friable. According to theſe characters, powdered platina is an earth, and chalk and all the calcareous earths are not earths. He divides earths into organical, metallic and lapidaceous. By *organic* earth is meant that of animals and vegetables; and though this earth is affirmed to be the ſame in both kingdoms, it is very certain that the vegetable earth differs eſſentially from the animal, and even one animal earth from another. The author admits that ſome animal earths burn into lime, and that others do not; how then can they be ſuppoſed to be in their real and interiour nature the ſame? The ſpecific characters of this *organic* earth, according to him, are, that it is *refractory in reſpect to vitrification*, which is true only of the animal earth; and that *it refuſes to*

combine

combine with acids[a], which is true neither of the animal nor vegetable. By *metallic* earths are meant the common calces of metals, which, being all capable of further decompoſition, are, according to the definition, not earths. Nor is it true that they refuſe to combine with mineral acids[b], for I do not know of any one calx which the marine acid will not diſſolve. *Lapidaceous* earths, or thoſe which form ſtones, are ſubdivided into vitreſcent per ſe, calcareous, and apyrous. Among the calcareous, or ſuch as burn into lime, are reckoned thoſe which burn not into lime, but into plaſter of Paris[c]; and among the apyrous, or thoſe which are not convertible into lime, is reckoned chalk[d], the very ſubſtance from which lime is generally prepared. As to earths vitreſcible per ſe, there is not a ſimple one known that is ſo. The author indeed gives a proceſs for vitrefying the earth of flint[e], but, like many others in this work, it is impracticable.—The criteria of ſalts are[f], to be ſoluble in water and cryſtallizable.

[a] Vol. i. Page 231. [b] 232. [c] 234. [d] 236. [e] 247. [f] 259.

According

According to theſe criteria, quicklime is a ſalt, and vegetable fixt alkaline ſalts are not ſalts. In regard to lime, the author is aware that it anſwers his definition of ſalts, and therefore expreſly admits that the pellicles which ſeparate from lime water are a true ſalt[a]; but this is again repugnant to the criteria; the pellicles, in their preſent ſtate, not being in the leaſt diſſoluble. Shall we call the earth, which incruſtates tea-kettles, a ſalt, becauſe it was once diſſolved in the water? Or the human calculus a ſalt, becauſe it was once diſſolved in the urine?

The author eſtabliſhes a new claſs of vegetable ſubſtances, under the name of *ſulphureous*, whoſe diſtinguiſhing character is, that they flame in a certain degree of heat[b]: But how does this diſtinguiſh them from gums, of which it is alſo ſaid, that in a certain degree of heat they flame and glow[c]. One of theſe ſulphurs is flowers of benzoine; but flowers of benzoine are[d] admitted to be ſoluble in water

[a] Vol. i. Page 290. [b] Vol. ii. Page 21. [c] 19. [d] 45.

and

and cryſtallizable, which are the very characters by which we are taught to diſtinguiſh ſalts. Eſſential oils are ſaid to be a ſpecies of ethereal oils[a], but they are ſaid alſo to be reſoluble into ethereal oils and reſin[b]; and how can they be a ſpecies of that which is only one of their ingredients? The ſpecific character of ethereal oils is, that they riſe with leſs heat than that of boiling water[c]; and yet the oily matter in burnt ſugar[d] and burnt gum[e] is called ethereal, though it will not riſe with double that heat. Theſe are ſufficient examples of our author's ſagacity in claſſing bodies, and fixing clear criteria.

He admits that many of his experiments are taken from other writers. They are in general, however, taken very inaccurately; almoſt every thing ſeeming to receive a wrong caſt in paſſing through his hands. Even Dr. *Lewis*'s experiments on *platina*, where he had all the accuracy and preciſion he could wiſh for, and of which by the bye he has evidently read only a part, are

[a] Vol. ii. Page 41. [b] 29. [c] 24. [d] 11. [e] 18.

by

by our author in many places misrepresented and misaken. He describes, for example, a process for separating platina from gold; by dissolving the compound in aqua regia, precipitating with fixt alkali, and washing the precipitate. The Doctor's experiment, from which this process is deduced by our author, proves that the platina cannot be separated by this means. He has generally done more than is expressed in his motto, *In nova fert animus*, &c. not only moulding the *body* into new forms, but evaporating the *spirit*.

I shall now, Gentlemen, leave the public to judge, what foundation there is for your encomiums of the *Institutes*; and how far the author's very unjust character of *Becher*, *Stahl*, *Boerhaave*, and other celebrated chemists, is just when applied to himself, that *the whole system is vain, empty, chimerical, and not to be even speciously deduced from any satisfactory experiments*; *That most of his opinions have no foundation but in his own fancy*; *or in that of others from whom he*

he has credulouſly copied the moſt abſurd falſities: That he has firſt invented an hypotheſis, and then invented facts to verify it: That, in regard to many facts, he is notoriouſly miſtaken, perhaps from that volatility of thought, which prevents his diſtinguiſhing betwixt the vigorous ſallies of imagination and demonſtrative reaſonings.[a]

The contemptuous vanity of this writer breaks forth equally in his other performances; and his other performances, (reckoning the *Elaboratory* and *Handmaid* to be ſuch) are equally contemptible with the preſent. I ſhould have ſent you ſome animadverſions upon them as they made their appearance, if I had not thought yourſelves to be more equal to the taſk. For though much of them is too abſurd for ſerious criticiſm, it is ſurely of importance to point out ſome of the material errors, to prevent the inexperienced reader from being miſled by them into unſucceſsful and expenſive ſchemes; or from being diſguſted with chemiſtry itſelf, from find-

[a] Vol. i. Page 228, 264, 279, 490, *&c. &c.*

ing ſo many things, delivered with the air of truth, prove on trial to be falſe.

Perhaps the foregoing obſervations on the *Inſtitutes* may put the public ſufficiently upon their guard; and remind the writers of the critical Reviews, that if they fail in their duty and profeſſed impartiality, they will not eſcape being properly expoſed.

——————Nothing extenuate,
Nor ſet down aught in malice.——

I am, Gentlemen,

Your conſtant Reader,

A. Z.